

CLAIMS

1. Method for determining transmit diversity for a transmitter having at least two transmit diversity branches, the method comprising the step of:

determining at least one transmit diversity branch for use based on estimated channel properties of transmit diversity branches.

2. A method as defined in claim 1, wherein the step of determining comprises determining the at least one transmit diversity branch for use using a transmit diversity performance indicator defined for a transmit diversity branch set, the transmit diversity performance indicator being dependent on at least estimated channel properties of transmit diversity branches belonging to the transmit diversity branch set.

3. A method as defined in claim 2, wherein the step of determining comprises using the transmit diversity performance indicator taking into account one or more of the following:

small-scale fading statistics, and specific channel coding.

4. A method as defined in claim 1, wherein the step of determining the at least one transmit diversity branch for use comprises taking into account a required outage probability.

5. A method as defined in claim 1, wherein the step of determining comprises determining the at least one transmit diversity branch for use based on said estimated channel properties comprising expected powers of transmit diversity branches.

6. A method as defined in claim 5, wherein the step of determining comprises evaluating a transmit diversity performance indicator using said expected powers.

7. A method as defined in claim 6, wherein the step of determining comprises calculating the transmit diversity performance indicator using the following formula:

$$\mu_k = k \sqrt{F_0 \prod_{m=1}^k \lambda_m},$$

where F_0 denotes the required outage probability, λ_m denotes the expected power of an m-th transmit diversity branch in a transmit diversity branch set Θ , and Θ is the number of transmit diversity branch indexes in the transmit diversity branch set Θ .

8. A method as defined in claim 6, further comprising the steps of:
evaluating said transmit diversity performance indicator for various transmit diversity branch sets and
selecting for use the transmit diversity branch set having an optimum transmit diversity performance indicator value.

9. A method as defined in claim 8, wherein the step of evaluating comprises evaluating said transmit diversity performance indicator for transmit diversity branch sets using a tree structure, a transmit diversity branch set relating to a child node having less transmit diversity branches than a transmit diversity branch set relating to a parent node of the child node.

10. A method as defined in claim 6, wherein the step of determining comprises evaluating the transmit diversity performance indicator defining a branch power threshold for adding a further transmit diversity branch to a transmit diversity branch set for use, the branch power threshold being dependent on the expected powers of the transmit diversity branches already selected to the transmit diversity branch set for use.

11. A method as defined in claim 10, wherein the step of determining comprises selecting the transmit diversity branches to the transmit diversity branch set for use in an order in accordance with estimated expected powers.

12. A method as defined in claim 1, wherein the step of determining comprises determining the at least one transmit diversity branch for use based on the estimated channel properties comprising second order statistics of channel coefficients of transmit diversity branches.

13. A method as defined in claim 12, wherein the step of determining comprises evaluating a transmit diversity performance indicator using said second order statistics.

14. A method as defined in claim 12, wherein the step of determining comprises using the second order statistics comprising at least one correlation matrix calculated using estimated channel coefficients.

15. A method as defined in claim 14, wherein the step of determining comprises calculating the transmit diversity performance indicator using the following formula:

$$\mu_{\Theta} = |\Theta| \sqrt{F_0 \prod_{m=1}^{|\Theta|} u_m},$$

where F_0 denotes the required outage probability, u_m denotes an m -th Eigenvalue of a correlation matrix relating to a transmit diversity branch set Θ , and $|\Theta|$ is the number of transmit diversity branch indices in the transmit diversity branch set Θ .

16. A method as defined in claim 13, further comprising:

evaluating said transmit diversity performance indicator for various transmit diversity branch sets and

selecting for use the transmit diversity branch set having an optimum transmit diversity performance indicator value.

17. A method as defined in claim 16, wherein the step of evaluating comprises evaluating said transmit diversity performance indicator for transmit diversity branch sets using a tree structure, a transmit diversity branch set relating to a child node having less transmit diversity branches than a transmit diversity branch set relating to a parent node of the child node.

18. A method as defined in claim 12, further comprising:

constructing virtual transmit branches as linear combinations of physical transmit diversity branches, and wherein the estimated channel properties comprise expected powers of said virtual transmit branches.

19. A method as defined in claim 18, wherein the step of constructing comprises constructing the virtual transmit branches as Eigenvectors of a channel correlation matrix derived from estimated channel coefficients and expected powers of the virtual transmit branches are determined as Eigenvalues of respective Eigenvectors.

20. A method as defined in claim 18, wherein the step of determining comprises determining the at least one transmit diversity branch using a transmit diversity performance indicator defining a branch power threshold for adding a further virtual transmit branch set for use, the branch power threshold being dependent on the expected powers of the virtual transmit branches already selected to the virtual transmit branch set for use.

21. A method as defined in claim 20, wherein the step of determining comprises selecting the virtual transmit branches to the virtual transmit branch set for use in an order in accordance with respective expected powers.

22. A method as defined in claim 1, further comprising:
allocating transmission power evenly to physical transmit diversity branches or virtual transmit diversity branches selected for use.

23. A method as defined in claim 1, further comprising:
transmitting information using transmit diversity branches selected for use.

24. A method as defined in claim 1, further comprising:
estimating channel properties using channel coefficients at a transmitter.

25. A method as defined in claim 1, further comprising:
estimating channel properties using channel coefficients at a receiver.

26. A method as defined in claim 1, wherein the step of determining comprises determining the at least one transmit diversity branch for use for a receiver independently of other receivers.

27. A method as defined in claim 1, wherein the step of determining comprises determining the at least one transmit diversity branch for a radio link independently of other radio links employed by a transmitter.

28. A method as defined in claim 1, wherein the step of determining comprises determining the at least one transmit diversity branch for use for a transmitter, for use with a receiver.

29. A network element for use in transmit diversity, the network element comprising:

- establishing means for establishing estimated channel properties of at least two transmit diversity branches, and

- determining means for determining transmit diversity branches for use based on the estimated channel properties.

30. A network element as defined in claim 30, the network element further comprising said at least two transmit diversity branches and transmitting means for transmitting information over a radio interface using selected transmit diversity branches.

31. A network element as defined in claim 31, said network element comprising a base station of a cellular communications system.

32. A network element as defined in claim 30, said network element comprising a base station controller of a cellular communications system.

33. A network element as defined in claim 31, said network element comprising an access point of a wireless local area network.

34. A radio transmitter having at least two transmit diversity branches, the radio transmitter comprising:

- establishing means for establishing estimated channel properties of at least two transmit diversity branches, and
- determining means for determining transmit diversity branches for use based on the estimated channel properties.

35. A radio transmitter as defined in claim 35, the radio transmitter comprising a mobile station for a cellular telecommunications network.

36. A radio transmitter as defined in claim 35, the radio transmitter comprising user equipment of a wireless local area network.